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REDESCRIPTION OF *AMPHISBAENA*
VERMICULARIS WAGLER, WITH COMMENTS
ON ITS RANGE AND SYNONYMY
(*AMPHISBAENIA*: REPTILIA)¹

By

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INTRODUCTION

Few names in the proverbially confused genus *Amphisbaena* have been the subject of as many misconceptions as *A. vermicularis* Wagler, 1824, the third species therein described, and the type species of *Glyptoderma* Fitzinger (1843). Contributing to this confusion have been the antiquity of the name, the obscure status of the holotype, the extensive range across areas poorly represented in most museum collections, lack of understanding regarding the nature of character variation in amphisbaenids, and the arbitrary identification by authorities.

Thus Boulenger (1885, p. 442) based his description of *A. vermicularis* upon one specimen of *A. dubia* Müller and on a second and disintegrating individual that remains to be identified. Burt and Burt (1931, p. 240) included a specimen of *A. mitchelli* Procter, a mistake later repeated by da Cunha (1961, p. 168; cf. Gans, 1964). Amaral (1935b, p. 255 and in later papers) erected a new race for specimens from northeast and central Brazil, and included the perfectly valid form "*Amphisbaena*" [= *Bronia*] *brasiliiana* and *A. steindachneri* in synonymy. He also considered *A. vermicularis* to be conspecific with *A. darwini* Duméril and Bibron, a valid form of southern Brazil and Uruguay (cf. Vanzolini, 1949, p. 105, for comments on these decisions). Even Schmidt (1936, p. 30) described specimens of *A. vermicularis* from Rio Grande do Norte, Brazil, as *A. spixi* with-

¹ Notes on amphisbaenids 20.

out considering the one valid amphisbaenid described from specimens brought back by the Spix expedition.

The present standardized (Gans and Alexander, 1962) redescription and synonymy is based upon a reexamination of the several types and on some 150 specimens from European, United States, and South American collections. While we are aware of more than sixty papers mentioning the species, we have cited only those involving certain identifications, as most are obviously meaningless without the specimens at hand or are known to have been based on other species.

This discussion gives but the minimal presentation of the major patterns of variation in the meristic characters of this species. Details have been omitted, and no attempt has been made to correlate the observed trends with climatic or other factors, since such correlation represents a project being undertaken by Dr. P. E. Vanzolini and his students.

Vanzolini (1951, manuscript, p. 31) has suggested that *A. mertensi* Strauch, 1881, may well be a race of *A. vermicularis*. Our material does not confirm him, though the sample has not been sufficient to rule out this possibility, and it will be discussed in a later paper.

We are grateful to the following curators of institutions (identified by abbreviation symbols in parentheses) for loan of specimens in their care: Charles M. Bogert, and Richard G. Zweifel, American Museum of Natural History, New York (AMNH); Miss Alice G. C. Grandison, British Museum (Natural History), London (BM); Alan Leviton, California Academy of Sciences, San Francisco (CAS); Neil D. Richmond, Carnegie Museum, Pittsburgh, Pa. (CM); Hymen Marx and Robert F. Inger, Chicago Natural History Museum, Chicago, Illinois (CNHM); A. S. Rand and P. E. Vanzolini, Departamento de Zoologia, São Paulo, S. P., Brazil (DZ); F. W. Braestrup, Universitetets Zoologiske Museum, Copenhagen, Denmark (KM); Ernest E. Williams, Museum of Comparative Zoology, Cambridge, Mass. (MCZ); Daley Albuquerque, Museo E. Goeldi, Belem, Pará, Brazil (MEG); Villy Aellen, Muséum de Genève, Switzerland (MG); Antenor L. de Carvalho and Bertha Lutz, Museo Nacional, Rio de Janeiro, G. A., Brazil (MN); Konrad Klemmer, Senckenbergische Naturforschende Gesellschaft, Frankfurt a. M., Germany (SMF); Heinz Wermuth, Staatliches Museum für Naturkunde, Stuttgart, Germany (SMNS); Charles F. Walker, University of Michigan Museum of Zoology, Ann Arbor, Michigan (UMMZ); Doris M. Cochran, United States National Museum, Washington, D. C. (USNM); Joseph Eiselt, Naturhistorisches Museum zu Wien, Vienna, Austria (VM); Heinz Wermuth and G. Peters, Zoologisches Museum der Universität, Berlin, Germany (ZMU); and Walter Hellmich, Zoologische Sammlung des Bayerischen Staates, Munich, Germany (ZSM). Dr. Virginia Cummings drew the specimens and Misses Geraldine Franklin and Charlyn Rhodes furnished technical assistance. The

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***Amphisbaena vermicularis* Wagler.**

Amphisbaena vermicularis WAGLER, 1824, p. 73. Terra typica: "in provincia Bahiae," "dans environs de la ville de Bahía," Brazil. HOLOTYPE: ZSM 660/0.

Amphisbaena vermicularis centralis AMARAL, 1935, p. 255 (also 1937, p. 1705). Terra typica: "Canna Brava, Goiás," Brazil. HOLOTYPE: DZ 6618. PARATYPES: DZ 1925, 6588, 6619-6621, 6673 (Cana Brava); 6575, 6622 (Rio Pandeiro, Minas Gerais).

Amphisbaena spixi SCHMIDT, 1936, p. 30. Terra typica: "Ceara Mirim, Rio Grande do Norte," Brazil. HOLOTYPE: CAS 49423. PARATYPES: CNHM 64421-64422 (Marx, 1958, p. 453); CAS 49896 (Brazil).

DIAGNOSIS. A medium- to large-sized, elongate form of *Amphisbaena* having a fairly blunt snout; without fusion of head shields; with the prefrontals the largest segments by far; with minimal enlargement of parietals; with generally four supra- and three infralabials; and with a relatively long, cylindrical, bluntly terminating tail. The form has 211 to 254 body annuli; five to seven (generally six) caudal annuli up to the autotomy constriction (at which the tail is autotomized in 23.6 per cent of the specimens); 23 to 30 caudal annuli from the cloaca to the tip of the tail, which may be slightly compressed in a very few specimens; 18 to 26 dorsal and 18 to 25 ventral segments to a mid-body annulus; and four round precloacal pores in all specimens. The tail is characteristically elongate and cylindrical; the species has only lateral sulci. The color of preserved specimens is a uniform brownish dorsally, becoming lighter ventrally. The coloration occasionally gives the impression of being denser along the anterior edge of each annulus, with the fading-out along the side occurring diagonally from posterior to anterior edge of an annulus. The dorsal surface of the tail and of the head are darker, but the intersegmental sutures are lightened, thereby giving the neck a characteristic reticulated pattern.

GEOGRAPHIC VARIATION. The available samples are insufficient for more than a preliminary estimation of trends. Adequate representation is most clearly available for some localities in the states Pernambuco, Bahia, Minas Gerais, and Goiás, though even these states hardly show a complete sampling. The records for Pará come from enough sources to suggest that *A. vermicularis* occurs in that state, though the specimens may not actually stem from the (rain forest?) sites from which they are recorded. The São Paulo and Rio de Janeiro records are probably spurious, but there is no reason to doubt the Bolivian one, so that the species may well extend close to the foothills of the Andes. Unfortunately there is a large, but disappointing (since probably composite) series labeled with such central Brazilian place names as Borba, Cuyaba, and Rio Branco. These Vienna Museum specimens stem from the Natterer collection, known to have become confused (Gans, 1955), and internal evidence suggests that this is indeed the case.

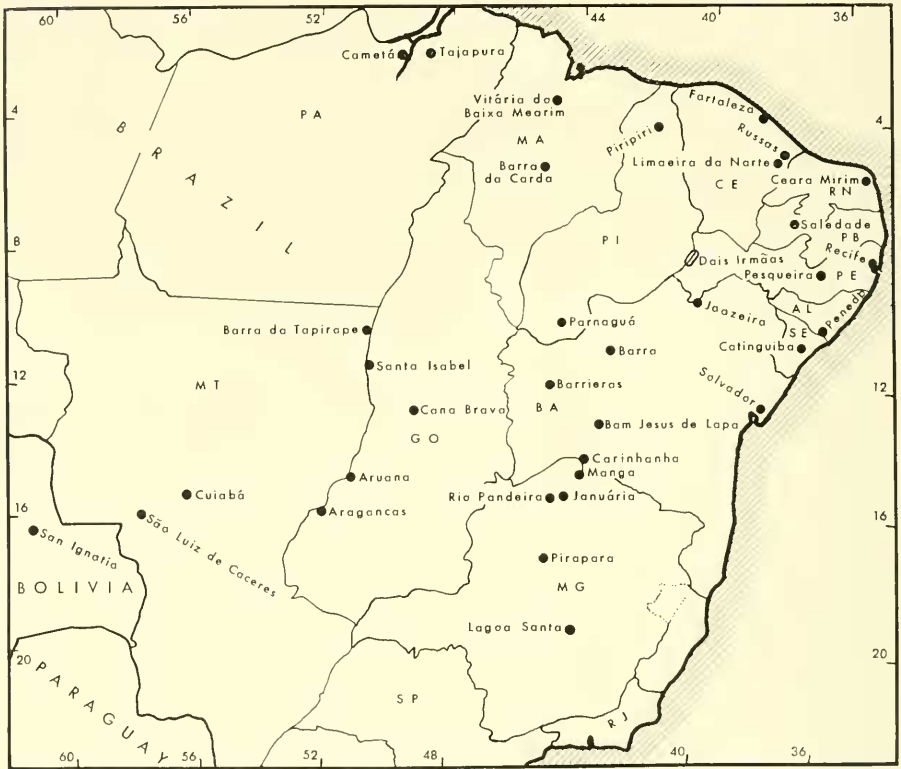


FIGURE 1. *Amphisbaena vermicularis*. Sketch map to show localities mentioned in text.

The general pattern of geographical variation is highly complex, and shows only a few sharp boundaries and almost no concordance. While there are several instances of marked local differences for individual characters, as yet there is no reason for recognizing subspecies within this assemblage. Publication of the available data may permit future workers to test and refine the roughly sketched pattern.

(1) *Number of body annuli*. Figure 2A presents a summary of the variation of number of body annuli. The highest values are found in the northeast where *A. vermicularis* overlaps *A. pretrei* (Gans, 1965) which also has high values. Somewhat lower values are found in Goiás and possibly in a narrow corridor extending into Bolivia. The two latter groupings are separated by an area of very low counts in inland Bahia. Equivalent low counts are found in southern Minas Gerais (Lagoa Santa), while southern Bahia, northern Minas Gerais specimens, as well as those from the northernmost parts of the species range, have intermediate values.

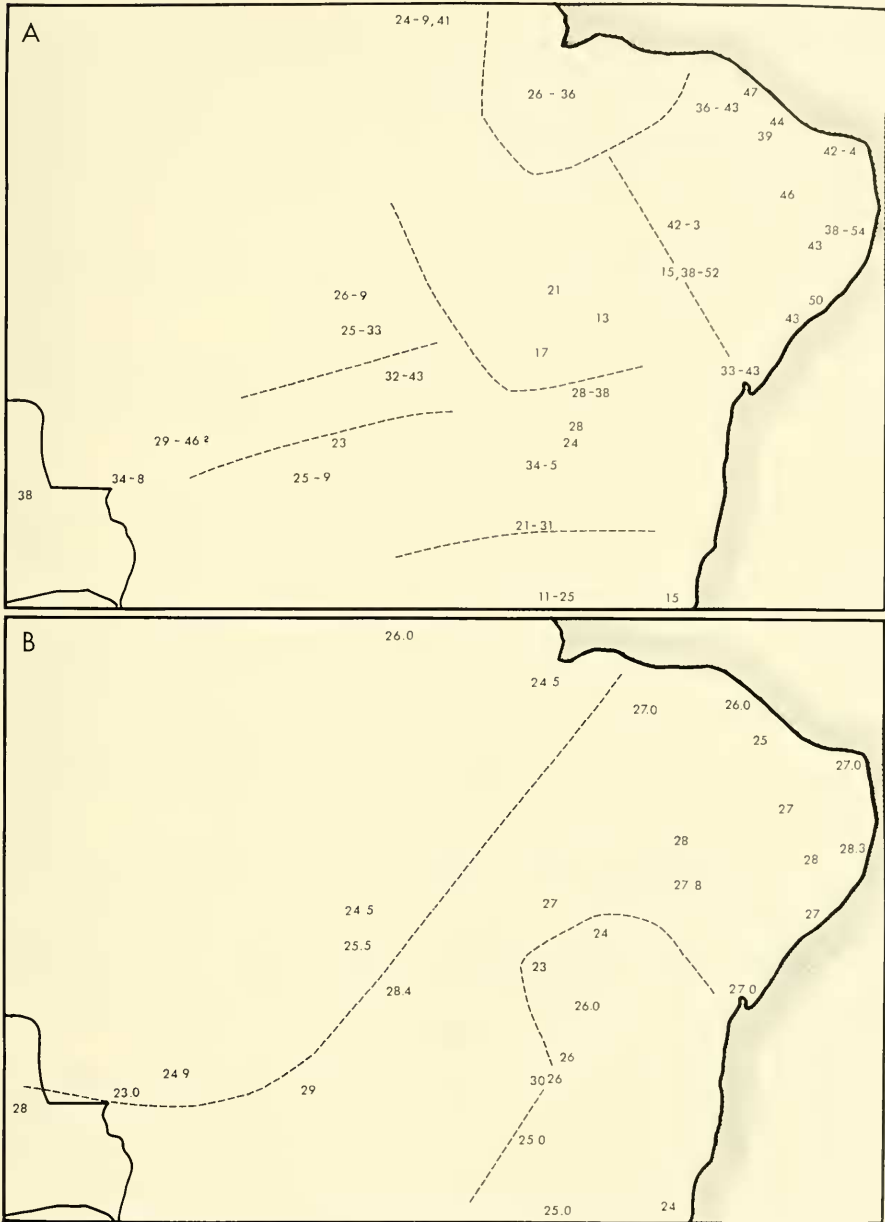


FIGURE 2. *Amphisbaena vermicularis*. Sketch maps (traced from the central portion of fig. 1), to show the pattern of character variation. The lines are added to facilitate visualization; they are obviously not calculated. A. Counts of body annuli with the first numeral (= 2) omitted. B. Counts of caudal annuli. Means are shown to one additional significant figure.

(2) *Number of caudal annuli.* Figure 2B presents a summary of the variation of this character. Again there is a tendency for high values in the northeast and in a belt inland to Bolivia. Yet the borders of the region are shifted significantly from those for high numbers of body annuli. There is no significant difference between the counts of the southern and the northern populations. The high values in the zone of sympatry with *A. pretrei* are of interest as these increase the difference between the two forms.

(3) *Number of segments to a mid-body annulus.* This character shows great intraspecimen and intrasample variation, which masks any geographic variation. The reality of the trends in the present material will have to be checked on the basis of larger series.

(4) *Body size.* *Amphisbaena vermicularis* is a much smaller species than *A. pretrei*. Histograms for several geographically defined populations (fig. 3) do not furnish grounds for assuming differences between them. The northern samples are obviously too small to permit comment.

(5) *Relative tail length.* The tail of *A. vermicularis* is relatively longer than that of *A. pretrei* or *A. leucocephala*. Tendency to intermediacy occurs in specimens of *A. vermicularis* from outside of the region of sympatry. Specimens from Bahia and Minas Gerais have the longest, and those from Ceara to Sergipe and Goiás to Bolivia relatively the shortest tails, though there is extensive scatter and broad overlap between samples (fig. 3). It is interesting to note that the sample from Bom Jesus de Lapa differs from the rest of the Bahia sample by having a significantly shorter tail, as do some of the Vienna Museum specimens from "Mato Grosso." These samples show no other correlated differences.

(6) *Color pattern.* A number of specimens from localities in Pará, Goiás, Minas Gerais, and Bolivia show an accentuation of the pigment along the anterior edge of each segment (*cf.* fig. 6). Only in Santa Isabel is this pattern found in all specimens of a sample; its frequency is low in other cases. Such accentuation (as opposed to an evenly distributed dorsal pigmentation) is always restricted to the anterior segmental edge, rather than covering half the segment as in *A. mertensi* Strauch (Gans, manuscript).

(7) *Head segmentation.* The parietals are generally small segments but slightly larger than the oculars, though they very occasionally exceed the frontals in size. Considerable variation exists within the species, indeed between the left and right sides of some specimens (fig. 5), but this does not seem geographically correlated or constant within single populations. The specimens with enlarged parietals are thus scattered over the entire range. Furthermore, the enlargement is extensive relative only to the condition found in most specimens of *A. vermicularis*; it almost never attains the proportions shown by specimens of *A. mertensi*.

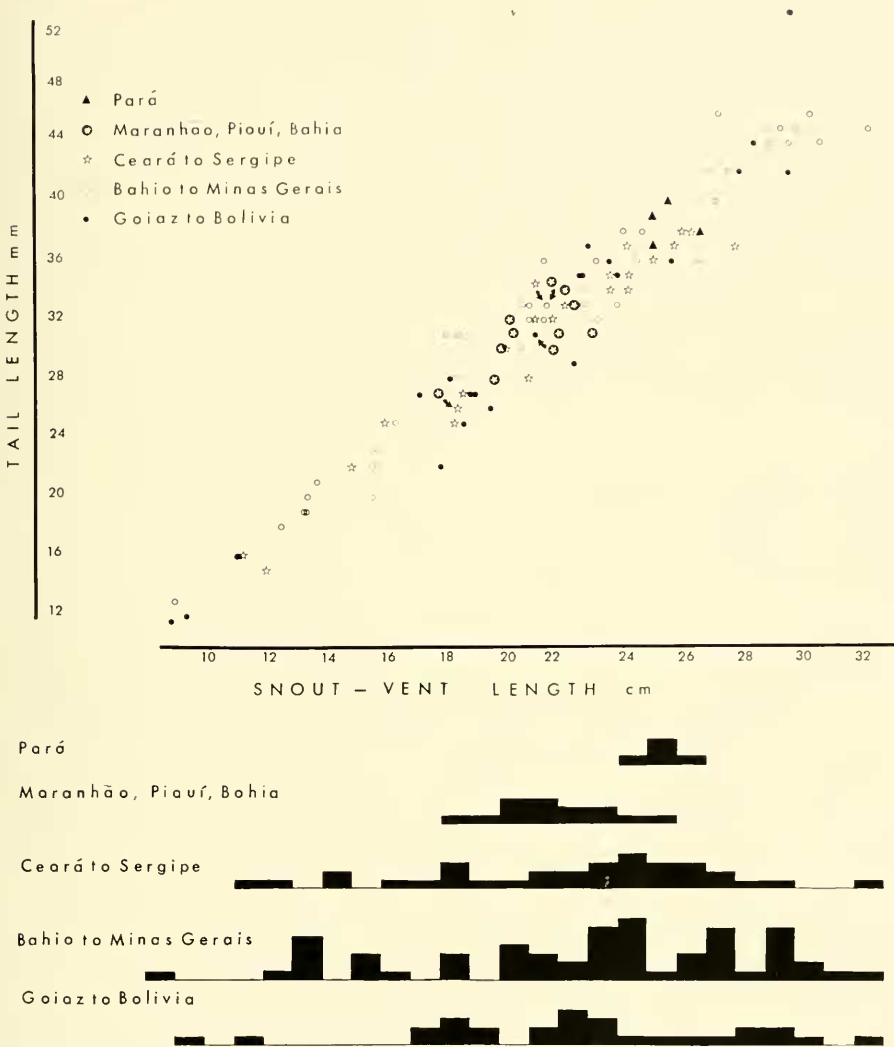
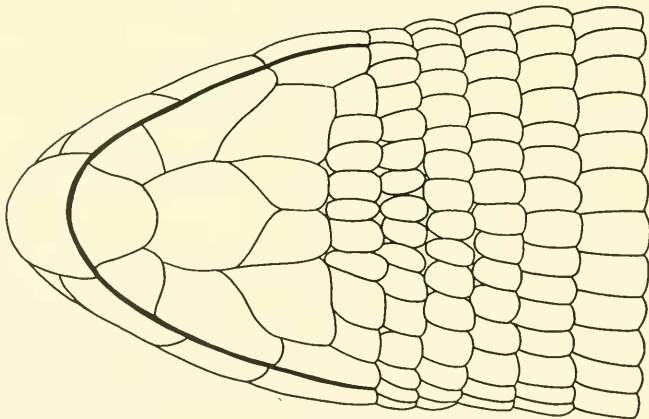
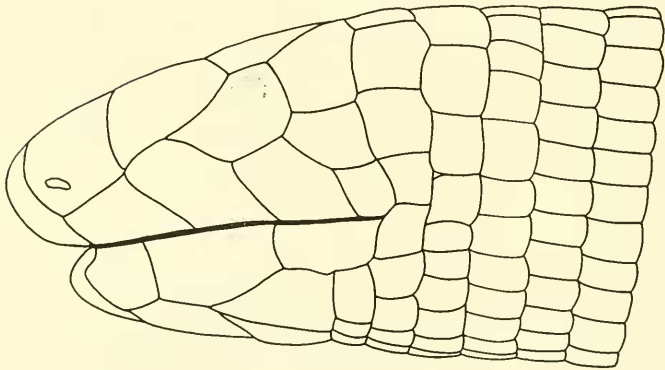
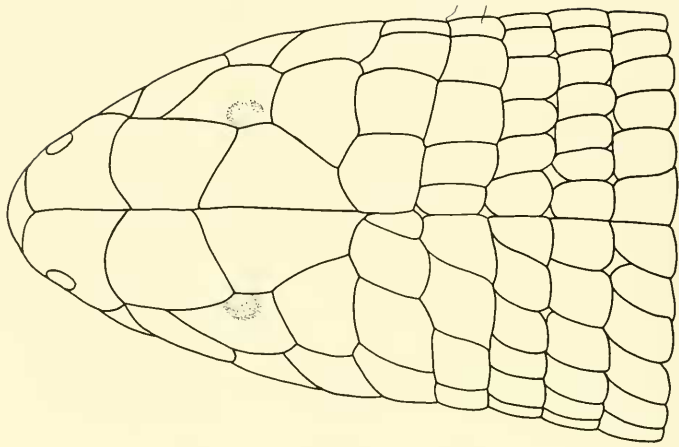


FIGURE 3. *Amphisbaena vermicularis*. Scatter diagram of tail-length versus snout-vent length and histograms for snout-vent length for the several geographical samples. The smallest vertical unit stands for a single specimen.

(8) *Preloacal pores*. All specimens except three out of a series of seven from Cana Brava, Goi s have four preloacal pores. The latter series has four specimens with four, two with five, and one with six pores. This suggests some similarity to the northern samples of *A. mertensi* (which have six or more pores).

NOTES ON THE TYPES. The holotype of *A. vermicularis* was collected by Spix and with other materials from his collection deposited in Munich where it



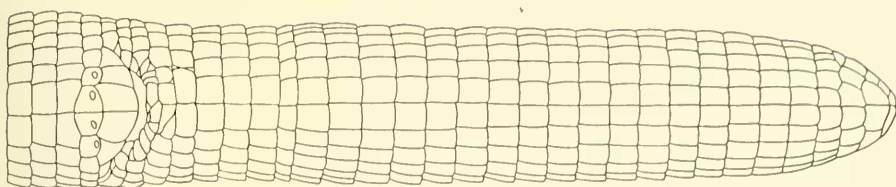


FIGURE 5. *Amphisbaena vermicularis*. Ventral view of cloaca and tail of ZSM 660/0, holotype from Bahia, Brazil. The line equals 1 mm. to scale. Drawn by Dr. V. Cummings.

remains (ZSM 660/0). The specimen is clearly the type and has been reported on at least twice (Strauch, 1881, col. 73; Hellmich, 1960, p. 97). Burt and Burt's claim (1931, p. 240) that the holotype was part of the (Wied) collection in the American Museum, is hence wrong. The specimen was available for analysis.

The typical material of *A. v. centralis* was in 1953 transferred from the Instituto Butantan (IB) to the Departamento de Zoologia (DZ), both of São Paulo, Brazil, and recatalogued there. Its data were used in the analysis. They show no differences justifying the retention of this race and thus confirm Vanzolini's remarks (1949).

All specimens referred to in Schmidt's 1936 study have been available for analysis. They show that the types of *A. spixi* are clearly assignable to *A. vermicularis* and the name thus belongs in the synonymy of that species.

DESCRIPTION. Figure 4 of the present paper shows views of the head of the holotype; fig. 5 shows the ventral surface of the cloaca and tail; and figs. 6 through 9, inclusive, show details of segmentation and coloration. Figure 3 shows body proportions of specimens from different regions. Meristic data are listed in table 1.

This is a medium- to large-sized species of *Amphisbaena* of a uniform brownish color dorsally, lighter ventrally, with the color dropping out gradually along the sides of the trunk. The lighter ventral coloration extends anteriorly onto the supralabials and posteriorly onto the anterior portion of the tail. In general the dorsal segments are evenly pigmented, without central pigment emphasis, but the intersegmental sutures are lightened. The dorsal surfaces of the head (nasals through parietals) and of the tail are more densely pigmented. The ventral surfaces, including the infralabials, are light colored. The pigment line first dips ventrad in the nuchal region and then rises again. The sides of the trunk dorsolateral to the cloaca exhibit half-moon-shaped zones of denser pigmentation that vary in extent and that may even meet at the dorsal

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FIGURE 4. *Amphisbaena vermicularis*. Dorsal, lateral, and ventral views of the head of the holotype ZSM 660/0, from Bahia, Brazil. The line equals 1 mm. to scale. Drawn by Dr. V. Cummings.

TABLE 1. *Data for specimens of Amphisbaena vermicularis.*

<i>Collection No.</i>	<i>Body, Lateral, and Caudal Annuli</i>	<i>Dorsal and Ventral Segments</i>	<i>Chin Segments</i>	<i>Labials</i>	<i>Cloaca</i>	<i>Total Length</i>
AMNH 1096	248+5+(7)26	20+20-1	3+8	4+3	4+7+15	225+30
CAS 49 896	252+3+(6)28	22+22	2+(5)+9	4+3	4+6+12	213+30
MSNUP 109	240+4+(7)28	20+22	4+7	3+3	4+8+14	261+39
SMF 11820	243+3+(5)28	20+21-2	2+9	4+3	4+8+13	270+38
ZMU 1381	218+4+(5)26	20+19-20	2+9	4+3	4+7+14	283+46
MHNP 1077	242+4+(6)27	20+22	2+9	4+3	4+8+15	248+39
USNM 6035A	224+4+(6)26	22+22	2+9	4+3	4+8+15	252+37
USNM 6035B	229+ $\frac{3}{4}$ +(5)26	22-3+22	2+9	4+3	4+6+13	257+40
VM 19A	226+4+(6)25	20-2+20	2+8	4+3	4+7+14	268+38
VM 19B	229+ $\frac{3}{4}$ +(6)27	21-2+22	2+9	4+3	4+8+14	252+39
MCZ 4658	241+ $\frac{1}{3}$ +(5)x	20+24	2+11	4+3	4+8+—	250+x
DZ 7053	234+4+(5)x	21+24-7	2+8	4+3	4+8+15	259+x
DZ 6377	234+4+(5)25	21-2+22-4	2+9	4+3	4+8+15	201+30
DZ 6378	226+3+(5)25	20-2+23-4	2+6	4+3	4+8+12	222+34
DZ 6379	233+4+(6)25	20-2+22-3	2+8	4+3	4+8+14	220+31
DZ 6380	231+ $\frac{3}{4}$ +(5)24	21-4+24	2+(1)+8	4+3	4+9+14	231+31
DZ 6381	227+4+(6)24	22-3+23-4	2+7	4+3	4+6+13	198+28
DZ 6382	230+4+(5)x	21-2+24-5	2+9	4+3	4+7+14	243+x
DZ 6383	232+4+(5-6)24	18-9+21-2	2+8	4+3	4+7+15	205+31
DZ 6458	228+4+(5)27	20-1+20-2	2+(1)+8	4+3	4+8+14	216+33
DZ 6459	236+3+(6)27	21-2+22-3	2+4+8	4+3	4+8+13	212+31
DZ 6460	235+3+(5-6)27	21+22-3	3+8	4+3	4+8+12	205+31
VM 12335-1	221+4+(5)27	23-4+22-4	2+9	4+3	4+8+14	203+32
DZ 6447	239+4+(5)27	21+21-2	2+8	4+3	4+7+12	227+29
DZ 3571	243+4+(5)27	20-1+22	5+(2)+9	4+3	4+8+14	238+33
MN 2101	241+4+(5)x	20-1+22	3+8	4+3	4+6+13	316+x
MN 2102	242+4+(6)25	21-2+22-3	2+8	4+3	4+7+12	287+37
MN 2103	236+4+(6)27	20-1+21-2	2+10	4+3	4+8+14	252+36
MN 2104	243+4+(6)25	20-1+22-3	2+9	4+3	4+7+14	210+28
MN 2090	244+4+(6)x	21-2+23-4	2+8	4+3	4+6+15	254+x
SMF 57919	239+3+(6)25	19-20+22	3+10	4+3	4+7+12	259+37
CAS 49423	244+4+(5)27	19-21+20-2	2+(3)+9	4+3	4+18+13	188+27
CNHM 64421	242+ $\frac{1}{3}$ +(7)x	20+20	—	—	4+8+16	144+x
CNHM 64422	244+ $\frac{3}{4}$ +(6)27	20+20-2	2+8	4+3	4+6+12	202+30
DZ 6474	246+ $\frac{1}{3}$ +(6)27	23-4+23	2+(1)+9	4+3	4+6+14	265+38
BM 87.9.5.4	247+3+(6)28	20+20	2+9	4+3	4+6+12	243+34
BM 87.9.5.5	240+4+(6)27	24+22	3+10	4+3	4+8+12	191+27
GM 983-59	249+4+(6)28	19-20+20	5+9	3+2 $\frac{1}{2}$	4+6+14	121+15
MCZ 1464	240+4+(6)29	20+22-3	2+(3)+9	4+3	4+6+12	243+37
USNM 59067	246+4+(6)28	20+22	3+10	3+2 $\frac{1}{2}$	4+6+12	238+35

TABLE 1. *Continued.*

<i>Collection No.</i>	<i>Body, Lateral, and Caudal Annuli</i>	<i>Dorsal and Ventral Segments</i>	<i>Chin Segments</i>	<i>Labials</i>	<i>Cloaca</i>	<i>Total Length</i>
USNM 59068	254+4+(6)x	—	5+9	3+2 ¹ / ₂	4+6+12	233+x
SMNS 3662A	242+3 ¹ / ₄ +(6)x	20-1+22-3	3+(2)+11	4+3	4+6+—	227+x
SMNS 3662B	238+4+(6)x	22+21-2	3+9	4+3	4+7+13	176+x
DZ 2670	239+4+(6)27	22+22	2+(1)+9	4+3	4+7+15	113+16
DZ 2671	250+3+(6)29	20+21	2+8	4+3	4+8+14	185+25
MN 1765	247+3+(6)28	20-1+22-3	3+9	4+3	4+7+14	262+38
MN 2087	246+4+(6)28	21-2+23-4	3+9	4+3	4+7+13	244+35
MN 2088	254+4+(6)30	19-20+23-4	5+9	4+3	4+8+14	161+25
MN 2083	246+3+(6)x	20-1+21-2	4+8	4+3	4+—	229+x
MN 2084	—	19+21-2	4+9	4+3	—	—
MN 2085	244+4+(6)28	18-20+21-2	3+10	4+3	4+7+13	218+32
MN 2086	242+3 ¹ / ₄ +(7)29	22-3+22	2+8	4+3	4+7+—	222+33
MN 2089	253+3+(7)28	20-1+23-4	3+8	3 ¹ / ₂ +2 ¹ / ₂	4+8+—	212+32
MN 2091	242+4+(5)x	20-1+20	3+9	4+3	4+7+15	233+x
MN 2092	243+3 ¹ / ₄ +(6)28	20-1+22	5+10	4+3	4+8+—	186+26
CM 1046	250+3+(6)27	20+20	—	3 ¹ / ₂ +3	4+—	150+22
KM R-4462	243+4+(7)x	20-2+22	2+(3)+9	3+3	4+8+13	284+x
ZMU 9387A	237+4 ¹ / ₅ +(6)28	20+20-1	2+10	4+3	4+6+11	210+33
DZ 6446	243+3+(6)29	19-20+22	2+9	4+3	4+7+12	215+36
ZSM 660/0	223+3 ³ / ₅ +(6)25	22-4+21-2	2+9	4+3	4+6+—	216+33
MN 2110	213+3+(6)x	24-6+24	3+8	4+3	4+8+13	327+x
MN 2111	242+3+(4)28	20-2+21-2	2+8	4+3	4+8+14	233+36
MN 2112	239+4+(7)30	19+20	2+5+8	4+3	4+8+14	182+31
MN 2113	245+4 ¹ / ₅ +(6)x	18-20+23	3+9	4+3	4+8+14	243+x
MN 2114	237+3 ¹ / ₄ +(6)30	20-1+22	2+3+9	4+3	4+8+14	186+31
UMMZ 103073A	237+4+(6)27	21-2+20-2	2+9	3+2 ¹ / ₂	4+8+13	305+46
UMMZ 103073B	236+4+(6)x	22+23-4	2+8	3+2 ¹ / ₂	4+6+12	274+x
UMMZ 103073C	241+4+(5)28	20+22	2+2+(10)	3+2 ¹ / ₂	4+8+13	250+38
UMMZ 103073D	242+4 ¹ / ₅ +(6)x	20+22	3+8	3+2 ¹ / ₂	4+7+14	248+x
UMMZ 103073E	237+4+(6)28	18-21+22	3+2+9	3+2 ¹ / ₂	4+7+10	165+25
VM 12330	252+3+(5)x	20+22	5+9	4+3	4+6+14	320+x
VM 20A	233+4+(6)27	22+24	2+8	4+3	4+8+13	294+45
VM 20B	237+4+(6)x	19-20+22	4+9	—	4+6+14	260+x
VM 20C	239+4+(6)x	22+24	4+10	4+3	4+8+14	242+x
VM 12	229+3+(5)24	22+24	2+10	4+3	4+6+14	225+33
MN 2109	220+4 ¹ / ₅ +(5)x	23-5+21-2	2+3+10	4+3	4+8+16	235+x
UMMZ 103072	217+4+(5)23	22+24-5	2+9	4+3	4+6+16	300+45
MN 2108	230+2+(7)26	20+20-2	2+8	4+3	4+8+13	240+33
MN 2115	228+3+(6)26	22-4+22-3	2+9	4+3	4+8+14	268+36
UMMZ 103071A	228+3+(6)26	24+22	2+7	4+3	4+8+13	325+45

TABLE 1. *Continued.*

<i>Collection No.</i>	<i>Body, Lateral, and Caudal Annuli</i>	<i>Dorsal and Ventral Segments</i>	<i>Chin Segments</i>	<i>Labials</i>	<i>Cloaca</i>	<i>Total Length</i>
UMMZ 103071B	234+ $\frac{1}{2}$ +(6)26	20+21-2	2+(3)+8	4+3	4+6+12	233+32
UMMZ 103071C	238+4+(5)x	23-4+24	2+(5)+11	4+3	4+7+12	237+x
MN 2107	228+4+(6)x	23-4+22	3+(1)+10	4+3	4+8+14	288+x
UMMZ 103070	224+3+(6)26	24+24	2+10	4+3	4+6+13	292+44
MCZ 3724	235+4+(7)x	22+24	2+9	4+3	4+8+10	270+x
UMMZ 103068A	235+4+(7)26	22+22-3	2+8	4+3	4+5+14	157+20
UMMZ 103068B	234+4+(6)x	22+22	2+10	4+3	4+6+12	137+x
DZ 6575	235+3+(7)30	20+24	3+8	4+3?	4+8+15	274+46
DZ 6622	x+(6)x	24+24	2+11	4+3	4+8+12	————
MN 2105	231+3+(6)25	21-2+19-20	4+10	4+3	4+8+13	215+32
MN 2106	221+3+(6)26	20+19-20	4+9	4+3	4+6+14	210+32
UMMZ 103069A	224+3+(5)24	23+23	2+8	4+3	4+7+12	308+44
UMMZ 103069B	226+4+(6)25	22+22	2+(1)+8	3 $\frac{1}{2}$ +2 $\frac{1}{2}$	4+6+13	207+30
KM R-4444	218+4+(5)25	22+24	2+10	4+3	4+8+14	247+36
KM R-4445	213+4+(5)23	24+22	2+9	4+3	4+6+16	248+38
KM R-4446	215+4+(5)25	22+20	2+10	4+3	4+6+13	271+42
KM R-4447	219+4+(6)x	22+20	2+10	4+3	4+6+—	272+x
KM R-4449	217+4+(6)25	22+22	————	————	4+6+14	126+18
KM R-4450	217+4+(6)26	20-1+20	2+10	4+3	4+7+12	242+38
KM R-4451	219+3+(5)24	22-3+20-2	2+10	4+3	4+7+15	228+33
KM R-4452	224+4+(6)x	22-3+23	2+9	4+3	4+8+14	298+x
KM R-4453	224+3+(6)27	19-22+20	2+8	4+3	4+7+14	138+21
KM R-4454	217+3+(5)26	22+21-2	2+8	4+3	4+6+13	134+19
KM R-4455	212+3+(6)24	22+22	2+9	4+3	4+6+13	158+23
KM R-4456	224+4+(5)25	20+20	2+10	4+3	4+6+14	218+35
KM R-4457	221+4+(5)25	22+22	2+10	4+3	4————	208+33
KM R-4458	214+ $\frac{3}{4}$ +(5)25	20-2+20	2+10	3 $\frac{1}{2}$ +2 $\frac{1}{2}$	4+7+14	185+28
KM R-4459	221+4+(6)25	21-2+22	2+10	4+3	4+6+14	135+20
KM R-4460	225+4+(5)26	21+21-2	2+9	4+3	4+6+12	135+19
KM R-4461	225+4+(5)26	20+20	2+9	4+3	4+8+14	90+13
KM R-4463	220+4+(6)24	20+22	2+10	4+3	4+8+15	273+40
MN 1425	220+4+(6)26	21-3+21-3	2+9	4+3	4+8+12	277+42
MN 1426	211+3+(6)24	22-3+20-2	2+9	4+3	4+6+14	157+22
MCZ 20651	235+4+(4)x	20+20	3+9	3 $\frac{1}{2}$ +2 $\frac{1}{2}$	4+6+11	307+x
VM 12335-2	215+4+(5)24	20+18-9	3+8	3 $\frac{1}{2}$ +2 $\frac{1}{2}$	4+7+12	237+30
DZ 1925	232+3+(6)29	21-3+20-1	3+9	4+3	4+6+15	245?+x
DZ 6588	238+4+(6)29	23+22-4	3+8	4+3	6+7+12	111+16
DZ 6618	240+ $\frac{3}{4}$ +(7)29	22-3+24	3+10	4+3	4+8+14	298+42
DZ 6619	238+5+(5)27	21-2+24-6	3+11	4+3	4+8+13	237+36
DZ 6620	236+4+(5)26	20-1+22	2+(4)+10	4+3	5+8+13	183+28

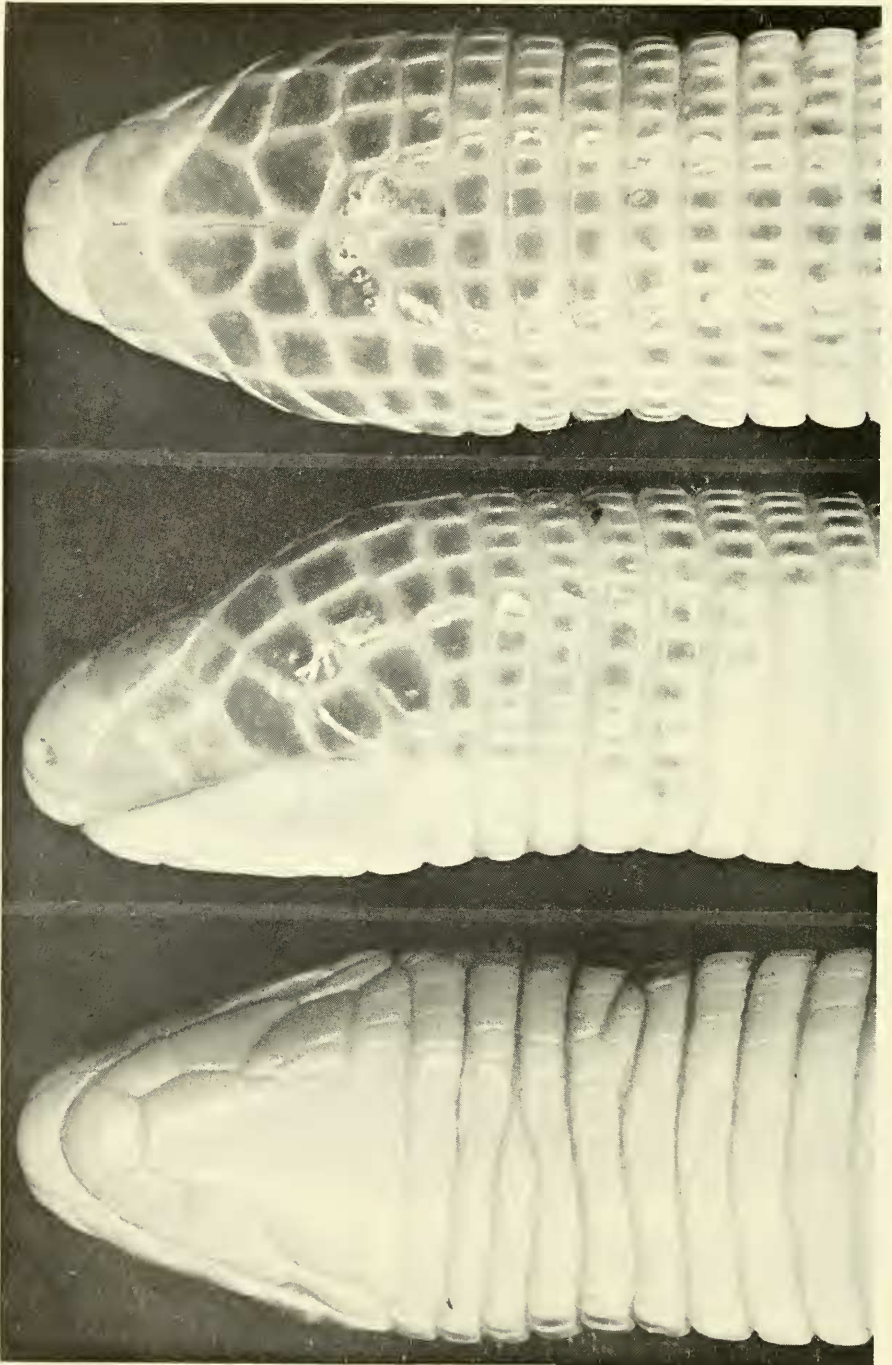
TABLE 1. *Continued.*

<i>Collection No.</i>	<i>Body, Lateral, and Caudal Annuli</i>	<i>Dorsal and Ventral Segments</i>	<i>Chin Segments</i>	<i>Labials</i>	<i>Cloaca</i>	<i>Total Length</i>
DZ 6621	232+3+(5)x	21-2+24	2+(2)+10	4+3	4+8+15	235+x
DZ 6673	243+4+(6)29	22+24	3+8	4+3	5+8+14	227+35
AMNH 90268	227+ $\frac{3}{4}$ +(6)x	23-5+21	2+9	4+3	4+8+12	299+x
AMNH 90269	233+3+(6)26	24+22	2+8	4+3	4+8+14	281+42
AMNH 92916	229+3+(6)x	20-2+21	2+8	4+3	4+8+14	271+x
DZ 6500	225+4+(6)25	22+23	2+9	4+3	4+7+12 [?]	240+35
DZ 2526	223+ $\frac{3}{4}$ +(6)x	22-3+23-4	2+9	4+3	4+8+13	266+x
MPEG 194	229+4+(6)29	20+20	2+8	4+3	4+8—	173+27
MPEG 225	225+3+(6)x	20+20-1	2+7	4+3	4+8+14	325+x
MPEG 576	228+4+(5)x	20+21-2	2+8	4+3	4+8+14	307+x
MN 1766A	229+3+(5)24	22-3+22-3	2+10	4+3	4+8+14	225+29
MN 1766B	226+ $\frac{1}{3}$ +(7)25	22-3+22	2+10	4+3	4+8+14	180+22
VM 12331-1	230+5+(6)28	22-4+23	2+10	4+3	4+6+13	298+51
VM 12331-2	246+4+(6)24	19-20+20-3	4+8	4+3	4+8+13	197+26
VM 12331-3	245+3+(7)25	19-20+20	5+9	4+3	4+8+16	212+27
VM 12331-4	237+4+(5-6)24	18+19-20	3+9	4+3	4+9+14	188+25
VM 16735-1	237+3+(6)27	21-2+22	3+7	4+3	4+8+15	192+27
VM 16735-2	236+3+(7)25	18-20+20	3+9	4+3	4+6+13	190+27
VM 12332-1	229+4+(6)26	19+21	3+8	4+3	4+6+14	286+44
VM 12332-2	234+ $\frac{3}{4}$ +(6)26	19-20+22	4+8	4+3	4+8+13	212+31
VM 12332-3	229+3+(6)27	18+20-1	2+9	4+3	4+6—	228+35
MN 1777A	234+5+(6)22	20-1+21-2	5+11	4+3	4+8+15	94+12
MN 1777B	238+4+(7)24	20-1+20-1	3+6	4+3	4+8+14	258+36
ZSM 226/33	238+3+(6)28	18+20	3+8	4+3	4+8+12	230+37

midline. The segment pigmentation in these zones is accentuated in the segmental center, yielding a markedly different pigmentation pattern.

A certain number of specimens (see Geographic Variation) have the anterior edge of the segments more densely pigmented or accentuated. This arrangement is generally combined with an overall darkening of the pigmentation. In such specimens there is often a roughly diagonal pigment dropout across each annulus, and the anterior edge of the ventral segments may also be accentuated by a series of posteriorly fading half-moons.

The head segmentation is characterized by lack of major fusions, by the very large prefrontals, and generally by the absence of parietal enlargement (see Geographic Variation). The parietal region commonly shows irregularities involving fusions within annuli and between adjacent annuli. The tip of the snout is relatively blunt and slightly produced; however, the bulging temporal area



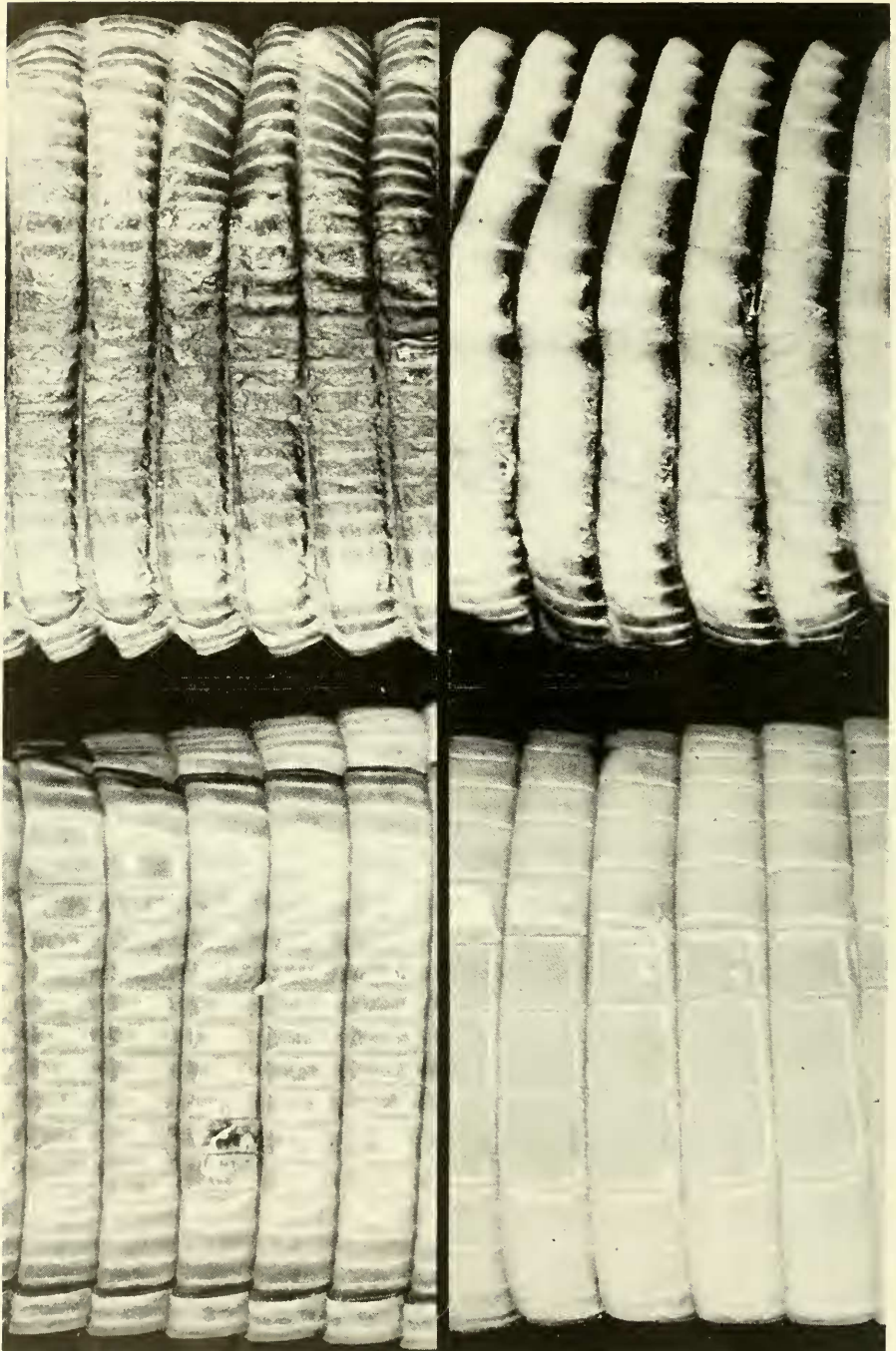
in adults is expressed by a considerable widening posterior to the eye. This yields a more pointed impression. The snout is almost as deep at the level of the nares as at the eye; it rises over the temporal bulges. The lateral projection of the lower jaw is triangular. The nuchal constriction is faintly indicated and there is only a very gradual increase in body diameter to a thickness equivalent to that of the head. The trunk is faintly oval in cross section continuing with a constant diameter until the level of the cloaca, where it is often reduced approximately one-third its former proportions.

The rostral is slightly larger than the first supralabial; it shows only a small triangular tip in dorsal view. Pairs of large, rectangular nasals, equal-sized prefrontals, and variously polygonal frontals, follow in sequence along the dorsal midline of the head. The nasal-prefrontal, and prefrontal-frontal sutures are always posteriorly concave. The posterior sutures of the frontals may be angled or form a continuous line. When the parietals are enlarged they are generally smaller than the prefrontals. The posterior edge of the frontals lies at a level approximately equivalent to the level of the suture between third and fourth supralabials. There are four supralabials; the first of these is the longest, the second the tallest, and the fourth the smallest in all dimensions. Only three specimens have the third supralabial split by a diagonal suture forming a small triangular supralabial and a large infraocular (rather than a large supralabial as in *A. pretrei*). The angulus oris, which ordinarily lies after the fourth supralabial, sometimes lies slightly anterior to this point, but it always lies along the posterior half of this segment. The supralabial sutures run anteriorly at angles of 45°, 70°, 60°, 60°, and 70° to the edge of the mouth. The ocular is diamond-shaped; its anterior tip is more acute than its posterior. Ventrally it contacts the posterior half of the second and all of the third supralabials' superior edges, and dorsally the posterior half of the prefrontal's lateral edge. Posteriorly the ocular contacts the entire anterior edge of the top and the dorsal tip of the next lower temporals; these are two approximately equal-sized, or two large and one smaller, segments that lie between the superior edge of the fourth supralabials and the lateral edges of the frontals. The ocular may also be in point contact with the frontal. The eye is large and clearly apparent.

The mental corresponds to the rostral in extent along the edge of the mouth. Centrally it sends back a broad, short, posteriorly convex process, that inserts into the anterior aspect of the large shield-shaped postmental. The anterior aspect of the postmental is flanked by the medium-sized first and the three times as large second infralabials. Its sides are contacted, along their posterior third.

←

FIGURE 6. *Amphisbaena vermicularis*. Dorsal, lateral, and ventral views of the head of MN R 2087 from Afogados, south of Recife, Pernambuco, Brazil. Note the asymmetrical parietals (fewer than 10 per cent of the samples have symmetrical nuchal shields) and the light margins of the head shields.



by the anterior tips of the large triangular malars, though either or both of a pair of smaller triangular segments, seemingly divided off their medial edges, may reduce the contact distance. Between these, and embracing the obtusely angled posterior aspect of the postmental, are the two larger central elements of the first, generally the only postgenial row. From one to four smaller segments occasionally form an irregular second postgenial row. The third infralabials are elongate and narrow. A row of 7 to 11, generally 8 or 9, irregularly shaped postmalar segments lies between the third infralabials; the lateralmost members of this row may or may not be faintly widened.

The first, second, or third body annuli split at or above the level of the angulus oris to provide two, one, or part of one dorsal intercalated half-annulus. The first, or second body annulus, or the intercalated half-annulus provide the segments of the parietal region. The interannular raphe between first and second generally, that between second and third always, lies in a position normal to the long axis of the trunk.

There are 211 to 254 body annuli (*cf.* fig. 2A) from the back of the fourth supralabial up to and including the pore-bearing precloacals. The first four to five body annuli are narrower than the succeeding ones, and the interannular raphes are deeper and wider than those between more caudad annuli. There is no significant complexing in the ventral region of the first body annuli, though annular asymmetries frequently occur here. The annular pattern is regular along the trunk and only shows modification in the postcephalic region and in the zone immediately anterior to the cloaca. There are no dorsal intercalated half-annuli. There are 18 to 26 dorsal and 18 to 25 ventral segments to a mid-body annulus (one specimen has 26 and another has 27, though these values cannot be checked since the specimens have already been returned). There is but little alignment of intersegmental raphes.

The cloacal region is characterized by a row of four, rarely and irregularly five or six, clearly marked, round to suboval precloacal pores in both sexes. Six to nine segments form the segment-shaped precloacal shield, but only the central six of these are generally of significant size. The postcloacals number 10 to 16; they are tiny slit-shaped segments that enter the cloaca in parallel with the interannular sutures, and only the central pair are widened. There are three to five, generally three or four, lateral annuli, and four to seven, generally five or six, caudal annuli up to and including the markedly narrowed autotomy annulus at which autotomy had taken place in 33 out of 144 specimens. Caudal annuli

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FIGURE 7. *Amphisbaena vermicularis*. Dorsal (left) and ventral (right) views at mid-body of AMNH 90269 from Santa Isabel, Goiás (top) and MN R 1765 from Afogados, south of Recife, Pernambuco, Brazil (bottom). The heads point to the right. Note the denser pigmentation of the Goiás specimen and the accenting of the anterior portions of the annuli on the ventral surface.

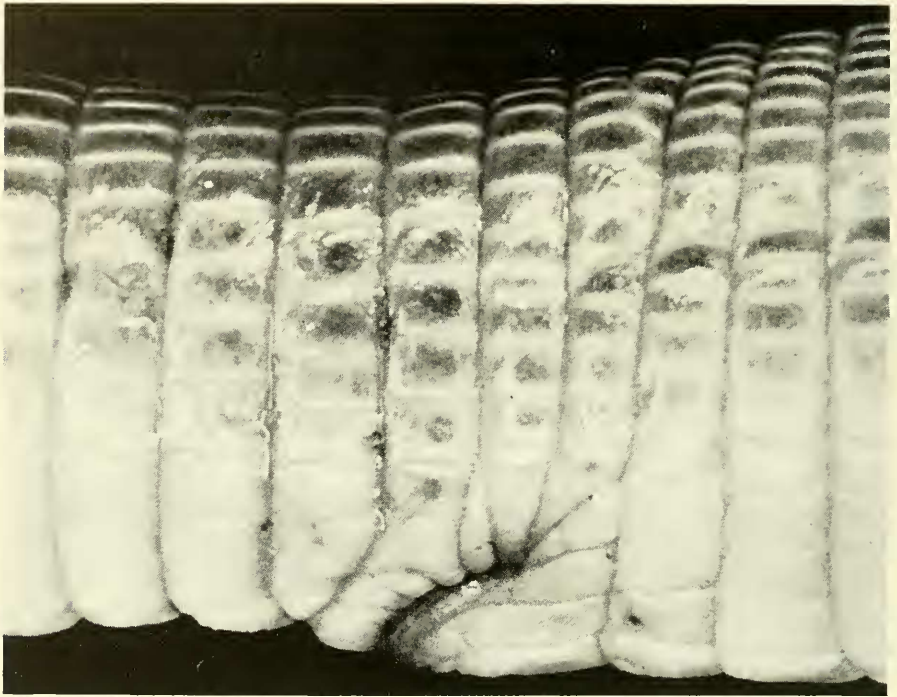


FIGURE 8. *Amphisbaena vermicularis*. Right lateral view of cloaca of MN R 2114 from Joazeiro, Bahia, Brazil, to show termination of lateral sulcus, and dot pattern on the lateral segments in the cloacal region.

number 24 to 30, all but the terminal pair separated from each other by well-defined and markedly inserted raphes, that often separate even the last ring of segments on the faintly compressed, rounded, caudal tip. The tail is horizontally oval in cross section; at the autotomy annulus it is markedly constricted, and thereafter it swells so that the distal portion is of significantly greater diameter.

The lateral annuli are clearly marked after the twenty-fifth to fiftieth body annulus; at mid-body they are about the width of one of the fringing segments and divided from these by a pair of diagonal lines that divide off their corners. Dorsal sulci are indicated in the neck region by a faint alignment of intersegmental raphes; they are absent at mid-body. There are no ventral sulci, though the median intersegmental sutures are aligned.

The middorsal segments vary from two and one-half to three times as long as wide. The midventral segments are slightly wider than long.

ANATOMY. The structure of the palate and of certain groups of head muscles is discussed by Lakjer (1926, 1927). Comments on the remnants of appendicular nerve plexi are included in Carlsson (1887), while details of the visceral circula-

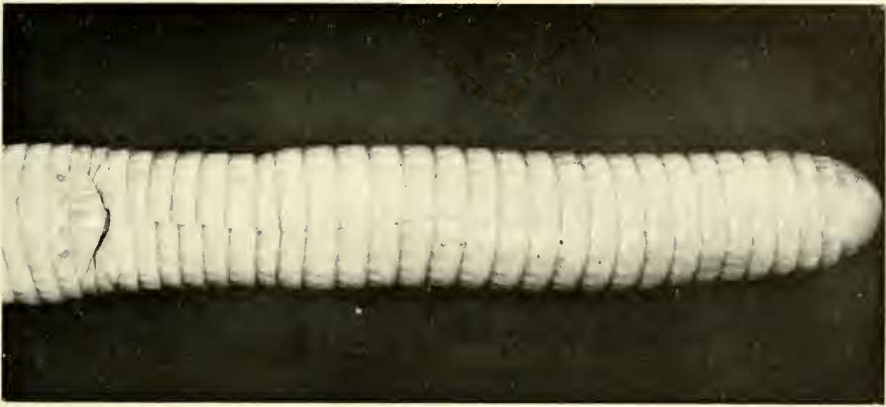


FIGURE 9. *Amphisbaena vermicularis*. Ventral view of cloaca and tail of MN R 1765 from Afogados, south of Recife, Pernambuco, Brazil.

tion are included in Hochstetter (1898) and Rathke (1857, 1863). Rosenberg (manuscript) describes the hemipenes.

RANGE. Brazilian lowlands, south of the Amazonian forest and west of the coast, inland into Bolivia, south into Minas Gerais, and Central Mato Grosso.

DISTRIBUTION RECORDS. BRAZIL: —: (Burt and Burt, 1931; Duméril and Bibron, 1839; Schmidt, 1936; Schmidt and Inger, 1951; Strauch, 1881): AMNH 1096; CAS 49896 (paratype *spixi*); MSNUP 109; SMF 11820 (?Mendoza); ZMU 1381. "St. Thomas": MHNP 1077. *Pará*: —: (Burt and Burt, 1930); USNM 6035A-6035B. Cameté, Rio Tocantins: (26 I 1911, no. 83) VM 19A-19B. Tajapura: MCZ 4658. *Maranhão*: Vitoria do Baixo Mearim: DZ 7053. Barra do Corda: DZ 6377-6383. *Piauí*: Piri-piri: DZ 6458-6460. Sierra de Parnagua: VM 12335-1. *Ceará*: (Vanzolini, 1949): DZ 6447. Fortaleza: DZ 3571. Mucuripe, Fortaleza: MN 2101-2104. Russas: MN 2090. Limoeiro do Norte: SMF 57919. *Rio Grande do Norte*: Ceará Mirim: (Schmidt, 1936; Schmidt and Inger, 1951): CAS 49423; CNHM 64421-64422. *Paraíba*: Açude Soledade: (Amaral, 1935a, 1935b): DZ 6474 (mentioned by Amaral, but not paratype of *A. centralis*). *Pernambuco*: —: BM 87.9.5.4-87.9.5.5; GM 983: 59; MCZ 1464; SMNS 3662A-3662B; USNM 59067, 59068. Recife: (Vanzolini, 1949): DZ 2670-2671. Recife, Afogados (south of): MN 1765, 2087-2088. Recife, Ypiringa: MN 2083-2086. Pesqueira: (Vanzolini, 1949): MN 2089. Dois Irmãos: MN 2091-2092. *Alagoas*: Barra do Penedo: (Griffin, 1917); CM 1046. *Sergipe*: Cotinguiba: KM R-4462. *Bahia*: —: (Vanzolini, 1949); ZMU 9387A. Salvador: DZ 6446. Salvador, environs: (Wagler, 1824; Hellmich, 1960); ZSM 6600 (holotype *vermicularis*). Joazeiro: MN 2110-2114; UMMZ 103073A-103073E; VM 12330. Barinha, near Joazeiro: VM 20A-20C. Barra, Cobre de Cabezas, Joazeiro: VM 12. Barreiras: MN 2109;

UMMZ 103072. Bom Jesus de Lapa: MN 2108, 2115; UMMZ 103071A-103071C. Carinhanha: MN 2107. *Minas Gerais*: Manga: UMMZ 103070. Januária: MCZ 3724; UMMZ 103068A-103068B. Rio Pandeiro: (Amaral, 1935b; Vanzolini, 1949); DZ 6575, 6622. Pirapora: MN 2105-2106; UMMZ 103069A-103069B. Lagoa Santa: (Lütken, 1892; Reinhardt and Lütken, 1861; Vanzolini, 1949); KM R-4444-R-4447, R-4449-R-4461, R-4463; MN 1425-1426. *São Paulo*: —: MCZ 20651. *Rio de Janeiro*: —: VM 12335-2. *Goiás*: Cana Brava: (Amaral, 1935b; Vanzolini, 1949); DZ 1925, 6588, 6618 (holotype *centralis*), 6619-6621, 6673 (type series). Santa Isabel, Ilha do Bananal: AMNH 90268-90269, 92916; DZ 6500. Aruana: DZ 2526. Araganças: (Cunha, 1961); MPEG 194, 225, 576. *Mato Grosso*: Barra do Tapirape: (Vanzolini, 1949); MN 1766a-1766b. ?Borba, Cuyaba: (Steindachner, 1867; cf. Gans, 1955); VM 12331-1-12331-4. Cuyaba: (Steindachner, 1867; cf. Gans, 1955); VM 16735-1-16735-2. Rio Branco and Borba: (Steindachner, 1867, cf. Gans, 1955); VM 12332-1-12332-3. São Luiz de Cáceres: (Vanzolini, 1949); MN 1777a-1777b.

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